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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/173,129    10/15/98    PARK

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EXAMINER

PERALTA, G  
ART UNIT

PAPER NUMBER

2814  
DATE MAILED:

02/27/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.

09/173,129

Applicant(s)

PARK ET AL.

Examiner

Ginette Peralta

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 06 December 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1,2,5-9,12-16 and 20-32 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-9,12-16 and 20-32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☐ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_

DETAILED ACTION

*Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

2. Claims 1-2, 5-9,12-15 and 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Nakajima et al. (U.S. Pat. 5,907,188), as previously applied.

Nakajima et al. teaches a method of fabricating an electrical device such as a transistor formed in a semiconductor substrate that comprises forming an insulating layer over the semiconductor substrate, forming a silicon containing structure on the insulating layer, forming a conductive structure on the silicon containing structure, oxidizing a portion of the insulating layer and the silicon containing structure while leaving the conductive structure substantially unoxidized by introducing an oxygen-containing gas selected from the group of oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>), and hydrogen (H<sub>2</sub>) to the insulating layer, the silicon containing structure and the conductive structure; wherein the insulating layer comprises silicon oxide; wherein the silicon containing structure comprises polycrystalline silicon; wherein the conductive structure comprises an oxygen-sensitive material; wherein the conductive structure comprises tungsten; wherein the oxidizing step comprises introducing the oxygen

containing gas and the hydrogen gas in a portion of a process chamber's total volume; and wherein the reaction between O<sub>2</sub> and H<sub>2</sub> does not increase the pressure in the processing chamber beyond a predetermined level (Col. 6, lines 34-55).

*Claim Rejections - 35 USC § 103*

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 20, 21, 23, 27-28, and 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al., as previously applied.

Nakajima et al. teaches a method of fabricating an electrical device formed in a semiconductor substrate that comprises forming an insulating layer over the semiconductor substrate, forming a silicon containing structure on the insulating layer, forming a conductive structure on the silicon containing structure, oxidizing a portion of the insulating layer and the silicon containing structure while leaving the conductive structure substantially unoxidized by introducing an oxygen-containing gas selected from the group of oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>), and hydrogen (H<sub>2</sub>) to the insulating layer, the silicon containing structure and the conductive structure, and wherein the reaction between O<sub>2</sub> and H<sub>2</sub> does not increase the pressure in the

processing chamber beyond a predetermined level (Col. 6, lines 34-55), by introducing the  $H_2$  at low partial pressure, lower than the explosion limit.

Thus, Nakajima et al. is shown to teach all of the features of the claim with the exception of increasing the concentration of one of oxygen or hydrogen after a reaction begins, and increasing the pressure of the chamber as the reaction begins.

It would have been within the scope of one of ordinary skill in the art to vary the concentration of one of the reactants after the introduction into the chamber and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the  $O_2$  and  $H_2$  enter the chamber as the gases are introduced at a temperature where the reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

5. Claims 16, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komori et al. in view of Nakajima et al..

Komori et al. teaches a method of fabricating a memory cell as in Fig. 13 formed in a semiconductor substrate comprising the steps of providing a conductive layer 9 over the semiconductor substrate 5, providing a dielectric material 10 over the conductive layer 9, subjecting the conductive layer 9 and the dielectric material 10 to an oxygen-containing gas and a separate hydrogen-containing gas, wherein the dielectric material is oxidized and the conductive layer remains substantially unoxidized, oxygen-

containing gas comprises  $H_2O$ , and the hydrogen-containing gas comprises  $H_2$ , and wherein the reaction between  $O_2$  and  $H_2$  does not increase the pressure in the processing chamber beyond a predetermined level (Col. 6, lines 34-55).

Nakajima et al. teaches a method of oxidizing a dielectric layer and a silicon containing layer by introducing an oxygen containing gas that is selected from  $H_2O$  and  $O_2$  and a hydrogen containing gas comprising  $H_2$ .

It would have been within the scope of one of ordinary skill in the art to use the selective oxidation-of Nakajima et al. for the construction of a reliable capacitor where the conductive layer is left substantially unoxidized and to vary the concentration of one of the reactants after the introduction into the chamber and the reaction begins, in order to form an oxide with a desired thickness, therefore it would not yield any unexpected results as the selectivity towards the conductive structure is maintained by the use of specific reactive gases, and that the reaction occurs continuously as the  $O_2$  and  $H_2$  enter the chamber as the gases are introduced at a temperature where the reaction is favored, and the total pressure is controlled by starting the flow of hydrogen at a lower pressure in order to prevent a violent reaction.

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Komori et al. in view of Nakajima et al. as applied to claim 16 above, and further in view of Wolf.

Komori et al. as modified by Nakajima et al. teaches all the limitations in the claim with the exception of the use of a dielectric material comprising a material

selected from the group consisting of an oxide/nitride stack, BST, tantalum pentoxide or PZT.

Wolf teaches in Page 598 the use of tantalum pentoxide and oxide/nitride stacks instead of silicon oxide for a capacitor dielectric.

It would have been obvious to one of ordinary skill in the art to use either tantalum pentoxide or an oxide/nitride stack as dielectric as taught by Wolf, as these materials can increase the cell capacitance.

*Response to Arguments*

7. Applicant's arguments filed 12/8/00 have been fully considered but they are not persuasive.

With regards to Applicant's argument regarding the newly added limitation of the reaction of  $H_2$  and  $O_2$ , not increasing the pressure in the processing chamber beyond a predetermined level, it is noted in Col. 6, lines 34-55, that Nakajima et al. teaches the introduction of  $H_2$  at a lower pressure in order to prevent the pressure in the processing chamber to increase beyond a predetermined level, for the same motivation of the Applicant of preventing the violent reaction between the reactants and an explosion in the chamber.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (703)305-7722. The examiner can normally be reached on Monday to Friday 8:00 AM-4:00 PM.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703)306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

GP  
February 22, 2001

  
OLIK CHAUDHURI  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800